Cascade

PLC50

80 mm Manual Cryogenic Probe System

Overview

The PLC50 is the most cost-effective and simple, yet highly-precise probing solution for wafers and substrates up to 80 mm at cryogenic temperatures. Specially designed for laboratory requirements, it supports a wide range of applications, including I-V, C-V and RF, and can be used for probing down to 77 K with liquid nitrogen or 7 K with liquid helium. Application flexibility is ensured for DC and RF measurements of the latest silicon, compound semiconductor and superconductor devices. RF tests are supported by a wide range of probes, calibration substrates and other accessories, as well as WinCal XE™ calibration software. The unique LRRM, LRM+, NIST-style TRL and hybrid calibration methods are available with the WinCal XE wafer-level calibration and measurement software.

The PLC50 is equipped with a stable vibration isolating frame. The high-vacuum chamber with a hinged topside lid and an optical window made of quartz glass contains flanges for vacuum-tight mechanical feedthrough drives. Thus the chuck and up to six vacuum-type positioners can be easily operated from outside via cardan shaft. The high-vacuum pumping system consists of a wide-range Turbo-Molecular Pump (TMP), a diaphragm forepump, and a full-range vacuum gauge. The independently-cooled cryogenic shield ensures ice- and condensation-free probing.

The chuck stage and chuck are located inside the vacuum chamber. The probe platen is designed to mount up to six vacuum-type positioners on magnetic feet. For step-and-repeat contacting, the probe platen can be lifted up and down from outside the chamber by a unique mechanical drive. A high-resolution video microscope is mounted above the view-port.

The PLC50 can be customized with a number of instruments, including various video microscopes, optical motion analysis tools, or black bodies for exposure of the DUT with controlled IR radiation.

Features / Benefits

Flexibility	• Ideal for a wide range of applications such as RF, FA, DWC, MEMS and optoelectronic tests • A stable platen mounted with up to six positioners • Use with liquid nitrogen or helium, depending on the target temperature • Probing with an open chamber lid possible under atmospheric condition
Stability	• Solid station frame • Built-in vibration-isolation solution for superior vibration attenuation • Precise probe positioning with short and stable probe arms of positioners located inside the vacuum chamber • Independently cooled cold shield to guarantee condensation-free test environment
Ease of use	• Interfaces to all major analysis instrumentation, optics software and testers • Smallest footprint • Upgradeable in the field • Low cost of ownership • Fast return on investment • Scales with your requirements
High measurement throughput	• Independent control of chuck and positioners for fast step-and-repeat testing of the whole wafer • Platen lift (up and down) for simultaneous separation of all probes

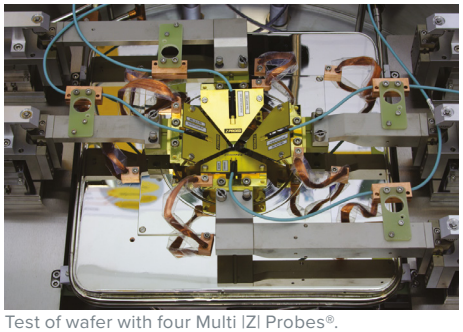
Note: For physical dimensions and facility requirements, refer to the PLC50 Facility Planning Guide.

Specifications

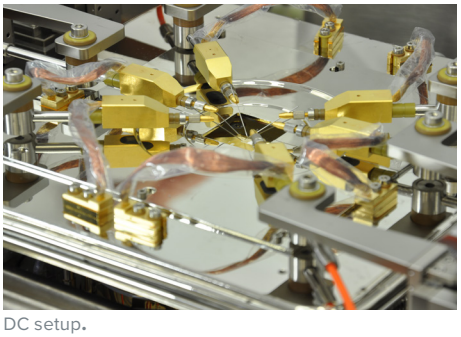
Chuck Stage	
X-Y travel	50 mm x 50 mm, optional 80 mm x 80 mm
Resolution	5 µm
Manipulation	Linear, from outside the chamber via rotary feed thru drives
Probe Platen	
Platen space	Universal platen for up to six VCP110 positioners
Z contact / separation	250 µm
Manipulation	From outside the chamber
Microscope	
Travel	Swivel mechanism for moving the microscope in a safe rest position for chamber opening
Focus	Manual drive
Type	Video zoom microscope
Zoom	7x
Magnification	0.38x to 2.6x
Resolution	240 lp/mm to 721 lp/mm
Field of view	12.8 mm x 17.1 mm to 1.8 mm x 2.4 mm
Cryogenic Chuck	
Minimum temperature	<7K, final device temperature depend on number and type of probe needles
Maximum temperature	400K, optionally up to 675K
Vacuum Chamber	
Size	Approximately ø 600 mm x 300 mm (H)
Material	Stainless steel
Loading	Hinged top side lid, made of aluminum, fast lock mechanism
View port	Central, top side, made of ø 90 mm quartz glass, 6 mm thickness, ø 75 mm clear opening, minimum objective working distance 75 mm
Feedtrough	
Chamber wall	• 6x DN50 ISO-KF flange for rotary feedthrough drives to operate VCP110 probe positioners from outside • 2x DN25 ISO-KF flange for rotary feedthrough drives for operating chuck XY stage from outside • 1x DN25 ISO-KF flange for rotary feedthrough drive for operating platen contact/separation drive from outside • 1x DN25 ISO-KF vacuum gauge • 2x DN50 ISO-KF flange for measurement feedthroughs • 1x DN25 ISO-KF flange with safety valve • 1x DN16 ISO-KF flange for venting valve, manually operated
Chamber bottom plate	• 1x DN100 ISO-K flange for measurement feedthroughs • 1x DN63 ISO-K flange for turbo-molecular drag pump • 2x DN40 ISO-KF flange (1x for cooling of chuck base with optional high temperature extension / 1x spare) • 2x DN16 ISO-KF flange (for chuck/shield exhaust) • 3x WDE105 feedthrough (2x for chuck/shield thermal control, 1x spare) • 1x Liquid gas inlet • 2x cold valve • 1x DN25 ISO-KF flange for vacuum gauge
Purging	Manual operated valve to vent the vacuum chamber with inert gas (N2)

Specifications (Continued)

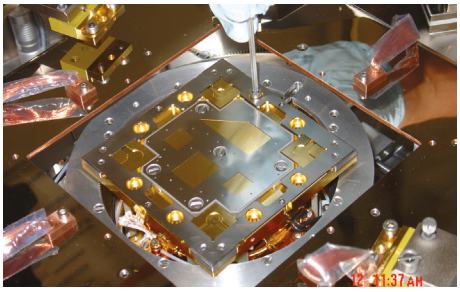
Carrier	
Wafer carrier	50 mm, 75 mm, 100 mm
Universal carrier	Small dies, wafer fragments
Positioner	
Type	VCP110 high-vacuum type probe positioner, max quantity 6x
Travel range	X, Y and Z = 12 mm linear
Fixation	Magnetic
Manipulation	From outside the chamber via rotary feed thru drives
Measurement Setup	
Probe arms	Triax, advanced coax and high frequency
Cabling	Triax, advanced coax and high frequency (40 GHz, 50 GHz and 67 GHz)
Feedtrough	Triax, advanced coax and high frequency (40 GHz, 50 GHz and 67 GHz)
Triax chuck	For low-noise I-V and C-V measurements
High Vacuum Sytem	
Minimum pressure	$< 5 \times 10^{-5}$ mbar
Maximum pressure	no cryogenic operation possible in this mode
Pump type	Turbo-molecular pump + membrane pre-pump
Vacuum gauge	Full range 5×10^{-9} to 1×10^{3} hPa
TV System	
USB	Digital camera connection to computer
HDMI	Digital camera connection to monitor
Microscope Upgrade	
Movement	Upgrade from default boom stand to high resolution XY microscope movement
Microscope	Upgrade from default video zoom microscope to high-magnification compound microscope
View-port	
Customized window	For applications where the standard window does not meet the requirements, other windows available with different window material, AR coating, working distance and diameter.



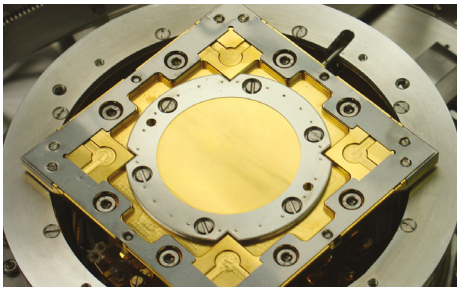
Test of wafer with four Multi |Z| Probes®.



DC setup.



Fixing universal carrier.



2 inch wafer carrier.

Ordering Informations

Components	Probe Station (Standard)	Probing solution for DC Test	Probing solution for RF Test
Mircoscope	X	X	X
Ball bearing boom stand	X	X	X
Vibration isolation table	X	X	X
Pump and Control Rack	X	X	X
Tool Kid (Thermal contact grease)	X	X	X
Tool Kid (Metric allen key set)	X	X	X
Extended Chuck Stage movement (80 mm x 80 mm)		X	X
Liquid gas Dewar		X	X
High Vacuum pumping Station		X	X
Substrate Carrier*		X	X
EPS-ACC-HDTV+ EPS-PKG Digital HDTV plus option package		X	X
Positioner VCP110 PLC-G2 Triax		X	
Vacuum rotary feedthrough drive for VCP110		X	X
4+1 Triax High-Vacuum feedthrough DN100 Iso-K		X	
Probe tip 7 mic tungsten: 25 tips		X	
Positioner VCP110 PLC-G2 RF east-west			X
High-Vacuum 2x-HF-Feedthrough DN50KF**			X
RF cable VAC 0.9m right-angle			X
RF precision cable 1.2 m flexible			X
Calibration substrate CSR-8			X
WinCal XE, full version, software key			X

* Selection of universal carrier or wafer carrier for 2" or 3" or 100mm or 150mm wafers
** Selection of 40GHz / 2.92mm feedthrough or 50GHz/67GHz / 1.85mm feedthrough, compatible also with 2.4mm system

The offered PLC50 packages include all required components for successful probing:

- PLC50 base system with a chuck movement of 80 mm
- High-vacuum pump station
- Substrate carrier for the required sample size
- Microscope with camera and monitor
- Cryogenic chuck and controller
- Liquid gas dewar (liquid Helium or liquid Nitrogen)
- Exhaust gas heater and exhaust gas pump in a separate pump/control rack

Warranty

Warranty*	Fifteen months from date of delivery or twelve months from date of installation
Service contracts	Single- and multi-year programs available to suit your needs

* *See FormFactor's Terms and Conditions of Sale for more details.*

Corporate Headquarters
7005 Southfront Road
Livermore, CA 94551
Phone: 925-290-4000
www.formfactor.com

PLC50-DS-0720